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Thermoelectric properties of InAs in the deep quantum limit

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The presence of a magnetic field leads the Fermi surface of a material to be quantized in Landau levels. At a sufficiently high field, all the carriers are confined in the lowest Landau level (0,-) : this is the so-called quantum limit. In this regime, the electronic spectrum is analogue to a 1D system and can be subject to electronic instabilities, such as charge or spin density wave order [1]. This is the case in graphite, where a succession of field induced states has been encountered [2]. In this poster, I will discuss the fate of a narrow gap semiconductor in the quantum limit, Indium Arsenide ($n_{e^-} = 2.2e16\ cm^{-3}$), through electrical and thermoelectrical (Seebeck and Nernst coefficients) measurements.
Beyond its quantum limit (B>4T), we observed a metal-insulator transition driven by the magnetic field, followed by a regime of saturation in both the electrical and thermoelectrical responses at higher field. This behavior is different from the ones of other insulating systems such as the SDW phase of PF_6 [3] for example. However it is also reminiscent of what has been observed in the quantum limit of graphite [4], possibly pointing to the existence of a universal electronic ground state in the quantum limit of 3D electron gas systems.

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